**PATENT APPLICATION**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

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| In re the Application of | : Atty. Docket No.: NC 83017 |
| Paul V. WERME et al. | : Group Art Unit: 2171 |
| Serial No.: 09/864,825 | : Examiner: Unknown |
| Filed: May 24, 2001 | : |
| For: **RESOURCE ALLOCATION DECISION FUNCTION FOR RESOURCE MANAGEMENT ARCHITECTURE AND CORRESPONDING PROGRAMS THEREFOR** | : |



**PRELIMINARY AMENDMENT UNDER 37 C.F.R. §1.111**

Honorable Assistant Commissioner
for Patents
Washington, D.C. 20231

Sir:

Prior to examination of the above-identified application on the merits, please amend the above-identified application as follows:

**IN THE SPECIFICATION:**

Attached hereto is a substitute specification and a machine generated red-line version of the specification showing the changes between the as-filed specification and the substitute specification. It is respectfully submitted that the substitute specification does not introduce prohibited new matter into the specification.

**IN THE CLAIMS:**

Please ADD new claims 2 - 36 as follows:

--2. On a host instantiating a managed characteristic application, a resource management device generating signals which one of starts up an additional copy of the managed characteristic application on one of the host and a second networked host, shuts down and restarts the managed characteristic application on the host, and moves the managed characteristic application to the second host responsive to first information regarding performance of all applications including the managed characteristic application and second information regarding performance of the host.--

--3. The resource management device as recited in claim 2, wherein the managed characteristic application comprises a scalable application.--

--4. The resource management device as recited in claim 2, wherein the managed characteristic application comprises a fault tolerant application, where the degree of fault tolerance is selectable by a user.--

--5. The resource management device as recited in claim 2, wherein the managed characteristic application comprises a selectable priority application.--

--6. The resource management device as recited in claim 2, wherein the managed characteristic application further responds to user-initiated control actions.--

--7. The program control device as recited in claim 2, wherein the resource management device generates signals instructing a program control device to modifies the configuration of the managed characteristic application.--

--8. In a grid system comprising networked hosts instantiating M managed characteristic applications, a resource management device generating signals which one of control configuration of an $M^{th}$ copy of the M managed characteristic application, start up of an $(M+1)^{th}$ copy of the M managed characteristic applications, shutdown and restart of the $M^{th}$ copy of the M managed characteristic applications, and movement of the $M^{th}$ copy of the M managed characteristic applications from a first to a second host responsive to first information regarding performance of the M managed characteristic applications and second information regarding performance of the hosts, where M is a positive integer.--

--9. The resource management device as recited in claim 8, wherein one of the M managed characteristic applications comprises a scalable application.--

--10. The resource management device as recited in claim 8, wherein one of the M managed characteristic applications comprise fault tolerant application, where the degree of fault tolerance is selectable by a user.--

--11. The resource management device as recited in claim 8, wherein one of the M managed characteristic applications comprises a selectable priority application.--

--12. The resource management device as recited in claim 8, wherein the resource management device further responds to third information regarding the performance of hardware operatively coupling the networked hosts.--

--13. The resource management device as recited in claim 8, wherein the resource management device further responds to fourth information establishing one of the priority assigned to the managed characteristic application and multiple copies of the managed characteristic application.--

--14. The resource management device as recited in claim 8, wherein the resource management device further responds to externally generated action requests.--

--15. The resource management device as recited in claim 14, where the action requests are generated by an operator.--

--16. In a distributed environment comprised of N hosts operating in a distributed environment instantiating M managed characteristic applications, resource allocation control software instantiated by at least the N hosts, the software comprising:

a first function which determines the state and health of the N hosts, a network operatively coupling the N hosts to one another and the M managed characteristic applications in the distributed environment;

a second function which determines required allocation and reallocation actions need to maintain Quality of Service (QoS) requirements established for the M managed characteristic applications; and

a third function which generates automatic control signal requests corresponding to the actions dictated by the QoS requirements.--

--17. The software as recited in claim 16, wherein the first function receives system specification information comprising selected ones of host configuration and capabilities, application capabilities, survivability requirements, scalability characteristics, application startup and shutdown dependencies, and application and path performance requirements.--

--18. The software as recited in claim 16, wherein the first function receives program control information comprising application status and detected application faults for each of the M managed characteristic applications, and detected failures regarding the N hosts.--

--18. The software as recited in claim 16, wherein the first function receives historical data regarding statuses, configuration, and loads of the N hosts and link statuses and loads regarding the network.--

--19. The software as recited in claim 16, wherein the first function receives application performance data representing each one of the M managed characteristic applications.--

--20. The software as recited in claim 16, wherein the first function receives application performance data on all applications instantiated by the N hosts including performance data representing each one of the M managed characteristic applications.--

--21. The software as recited in claim 16, wherein the second function which determines the required allocation and reallocation actions need to maintain the Quality of Service (QoS) requirements established for the M managed characteristic applications by:

responding to application and host failures by determining if and what recovery actions should be taken;

determining if and where to place new copies of one of the M managed characteristic applications or which of the M managed characteristic applications should be shutdown when QoS

Manager functions indicate that scale-up or scale-down actions are indicated based on measured application performance and application QoS specifications;

determining where new applications should be placed when requested to do so by a program control device; and

determining which and how many applications should run based on application system priorities.--

--22. The software as recited in claim 16, wherein one of the M managed characteristic applications comprises a scalable application.--

--23. The software as recited in claim 16, wherein one of the M managed characteristic applications comprises a fault tolerant application, where the degree of fault tolerance is selectable by a user.--

--24. The software as recited in claim 16, wherein one of the M managed characteristic applications comprises a selectable priority application.--

--25. The software as recited in claim 16, wherein the M managed characteristic applications comprise M copies of a single managed characteristic application.--

--26. Software stored on at least one host for converting N networked hosts into a resource managed system instantiating M managed characteristic applications, the software comprising:

a first function group which monitors the host and network resources

a second function group which provides general-purpose application event reporting and event correlation capabilities;

a third function group which provides the reasoning and decision-making capabilities for the resource managed system, wherein the third function group comprises:

a first function which determines the state and health of the N hosts, a network operatively coupling the N hosts to one another and the M managed characteristic applications in the distributed environment;

a second function which determines required allocation and reallocation actions need to maintain Quality of Service (QoS) requirements established for the M managed characteristic applications; and

a third function which generates automatic control signal requests corresponding to the actions dictated by the QoS requirements; and

a fourth function group which provides program control capabilities permitting starting, stopping, and configuring of selected ones of the M managed characteristic applications on respective ones of the N hosts in the resource managed system,

where M and N are positive integers.--

--27. The software as recited in claim 26, wherein the first function receives system specification information comprises host configuration and capabilities.--

--28. The software as recited in claim 26, wherein the first function receives system specification information comprising selected ones of capabilities, survivability requirements, scalability characteristics, startup and shutdown dependencies, and performance requirements for at least one of the M managed characteristic applications.--

--29. The software as recited in claim 26, wherein the first function receives system specification information comprising path performance requirements regarding communication between at least two of the N hosts.--

--30. The software as recited in claim 26, wherein the first function receives program control information comprising application status and detected application faults for each of the M managed characteristic applications, and detected failures regarding the N hosts.--

--31. The software as recited in claim 26, wherein the first function receives historical data regarding statuses, configuration, and loads of the N hosts and link statuses and loads regarding the network.--

--32. The software as recited in claim 26, wherein the first function receives application performance data representing each one of the M managed characteristic applications.--

--33. The software as recited in claim 26, wherein the first function receives application performance data on all applications instantiated by the N hosts including performance data representing each one of the N copies of the managed characteristic application.--

--34. The software as recited in claim 26, wherein the second function which determines the required allocation and reallocation actions established for the M managed characteristic application by:

responding to application and host failures by determining if and what recovery actions should be taken;

determining if and where to place new copies of managed characteristic applications or which managed characteristic applications should be shutdown when QoS Manager functions indicate that scale-up or scale-down actions should be taken based on measured application performance and QoS specifications established for the M managed characteristic applications;

determining where new applications should be placed when requested to do so by the fourth function group; and

determining which and how many applications should run based on application system priorities.--

--35. The software as recited in claim 26, wherein the third function group makes decisions by one of:

based on requests from Program Control, determining where new applications should be started;

based on indication of application failure from the fourth function group, determining whether and where the failed application should be restarted;

based on indication of host failure from the fourth function group, determining whether and where the failed application previously instantiated by the failed one of the N hosts should be restarted;

based on startup and shutdown dependency resolution requests from the fourth function group, determine whether and where additional applications should to be one of started and shut down prior to starting or shutting down another application; and

based on changes to application system priorities, determining whether and where new applications need to be started and/or determine whether and which existing applications need to be shutdown.--

--36. The software as recited in claim 26, wherein the third function group makes decisions one of:

based on application inter-dependencies defined in system specification files, determining whether and where additional applications should to be one of started and shut down prior to starting or shutting down of another application;

based on application instrumentation data generated by the second function group and performance requirements defined in the system specification files, determining whether applications are meeting performance requirements and whether an application can be scaled up or moved to attempt to improve performance; and

based on the application instrumentation data and performance requirements defined in the system specification files, determining whether applications are performing well within performance requirements and can be scaled down.--

## REMARKS

Claims 1-36 are pending in the Application. In the Preliminary Amendment, new claims 2-36 are added to recite features of the present invention that were previously disclosed but unclaimed in the application as originally filed. The attached Appendix contains a version of the claims without markings.

It is respectfully submitted that the instant Amendment does not introduce new matter into the application. It is also respectfully submitted that the Preliminary Amendment places the above-identified application in even better condition for initial examination.

In light of the amendments and remarks presented above, it is respectfully submitted that the application is in condition for allowance, and such action is hereby solicited.

If any points remain in issue which the Examiner feels may best be resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

Respectfully submitted,

James B. Bechtel
Reg. No. 29,890
Phone: (540) 653-8061

Date: September __, 2001

Atty. Docket No.: NC 83017

## APPENDIX

2. On a host instantiating a managed characteristic application, a resource management device generating signals which one of starts up an additional copy of the managed characteristic application on one of the host and a second networked host, shuts down and restarts the managed characteristic application on the host, and moves the managed characteristic application to the second host responsive to first information regarding performance of all applications including the managed characteristic application and second information regarding performance of the host.

3. The resource management device as recited in claim 2, wherein the managed characteristic application comprises a scalable application.

4. The resource management device as recited in claim 2, wherein the managed characteristic application comprises a fault tolerant application, where the degree of fault tolerance is selectable by a user.

5. The resource management device as recited in claim 2, wherein the managed characteristic application comprises a selectable priority application.

6. The resource management device as recited in claim 2, wherein the managed characteristic application further responds to user-initiated control actions.

7. The program control device as recited in claim 2, wherein the resource management device generates signals instructing a program control device to modifies the configuration of the managed characteristic application.

8. In a grid system comprising networked hosts instantiating M managed characteristic applications, a resource management device generating signals which one of control configuration of an $M^{th}$ copy of the M managed characteristic application, start up of an $(M+1)^{th}$ copy of the M managed characteristic applications, shutdown and restart of the $M^{th}$ copy of the M managed characteristic applications, and movement of the $M^{th}$ copy of the M managed characteristic applications from a first to a second host responsive to first information regarding performance of the M managed characteristic applications and second information regarding performance of the hosts, where M is a positive integer.

9. The resource management device as recited in claim 8, wherein one of the M managed characteristic applications comprises a scalable application.

10. The resource management device as recited in claim 8, wherein one of the M managed characteristic applications comprise fault tolerant application, where the degree of fault tolerance is selectable by a user.

11. The resource management device as recited in claim 8, wherein one of the M managed characteristic applications comprises a selectable priority application.

12. The resource management device as recited in claim 8, wherein the resource management device further responds to third information regarding the performance of hardware operatively coupling the networked hosts.

13. The resource management device as recited in claim 8, wherein the resource management device further responds to fourth information establishing one of the priority assigned to the managed characteristic application and multiple copies of the managed characteristic application.

14. The resource management device as recited in claim 8, wherein the resource management device further responds to externally generated action requests.

15. The resource management device as recited in claim 14, where the action requests are generated by an operator.

16. In a distributed environment comprised of N hosts operating in a distributed environment instantiating M managed characteristic applications, resource allocation control software instantiated by at least the N hosts, the software comprising:

a first function which determines the state and health of the N hosts, a network operatively coupling the N hosts to one another and the M managed characteristic applications in the distributed environment;

a second function which determines required allocation and reallocation actions need to maintain Quality of Service (QoS) requirements established for the M managed characteristic applications; and

a third function which generates automatic control signal requests corresponding to the actions dictated by the QoS requirements.

17. The software as recited in claim 16, wherein the first function receives system specification information comprising selected ones of host configuration and capabilities, application capabilities, survivability requirements, scalability characteristics, application startup and shutdown dependencies, and application and path performance requirements.

18. The software as recited in claim 16, wherein the first function receives program control information comprising application status and detected application faults for each of the M managed characteristic applications, and detected failures regarding the N hosts.

18. The software as recited in claim 16, wherein the first function receives historical data regarding statuses, configuration, and loads of the N hosts and link statuses and loads regarding the network.

19. The software as recited in claim 16, wherein the first function receives application performance data representing each one of the M managed characteristic applications.

20. The software as recited in claim 16, wherein the first function receives application performance data on all applications instantiated by the N hosts including performance data representing each one of the M managed characteristic applications.

21. The software as recited in claim 16, wherein the second function which determines the required allocation and reallocation actions need to maintain the Quality of Service (QoS) requirements established for the M managed characteristic applications by:

responding to application and host failures by determining if and what recovery actions should be taken;

determining if and where to place new copies of one of the M managed characteristic applications or which of the M managed characteristic applications should be shutdown when QoS Manager functions indicate that scale-up or scale-down actions are indicated based on measured application performance and application QoS specifications;

determining where new applications should be placed when requested to do so by a program control device; and

determining which and how many applications should run based on application system priorities.

22. The software as recited in claim 16, wherein one of the M managed characteristic applications comprises a scalable application.

23. The software as recited in claim 16, wherein one of the M managed characteristic applications comprises a fault tolerant application, where the degree of fault tolerance is selectable by a user.

24. The software as recited in claim 16, wherein one of the M managed characteristic applications comprises a selectable priority application.

25. The software as recited in claim 16, wherein the M managed characteristic applications comprise M copies of a single managed characteristic application.

26. Software stored on at least one host for converting N networked hosts into a resource managed system instantiating M managed characteristic applications, the software comprising:

a first function group which monitors the host and network resources

a second function group which provides general-purpose application event reporting and event correlation capabilities;

a third function group which provides the reasoning and decision-making capabilities for the resource managed system, wherein the third function group comprises:

a first function which determines the state and health of the N hosts, a network operatively coupling the N hosts to one another and the M managed characteristic applications in the distributed environment;

a second function which determines required allocation and reallocation actions need to maintain Quality of Service (QoS) requirements established for the M managed characteristic applications; and

a third function which generates automatic control signal requests corresponding to the actions dictated by the QoS requirements; and

a fourth function group which provides program control capabilities permitting starting, stopping, and configuring of selected ones of the M managed characteristic applications on respective ones of the N hosts in the resource managed system,

where M and N are positive integers.

27. The software as recited in claim 26, wherein the first function receives system specification information comprises host configuration and capabilities.

28. The software as recited in claim 26, wherein the first function receives system specification information comprising selected ones of capabilities, survivability requirements, scalability characteristics, startup and shutdown dependencies, and performance requirements for at least one of the M managed characteristic applications.

29. The software as recited in claim 26, wherein the first function receives system specification information comprising path performance requirements regarding communication between at least two of the N hosts.

30. The software as recited in claim 26, wherein the first function receives program control information comprising application status and detected application faults for each of the M managed characteristic applications, and detected failures regarding the N hosts.

31. The software as recited in claim 26, wherein the first function receives historical data regarding statuses, configuration, and loads of the N hosts and link statuses and loads regarding the network.

32. The software as recited in claim 26, wherein the first function receives application performance data representing each one of the M managed characteristic applications.

33. The software as recited in claim 26, wherein the first function receives application performance data on all applications instantiated by the N hosts including performance data representing each one of the N copies of the managed characteristic application.

34. The software as recited in claim 26, wherein the second function which determines the required allocation and reallocation actions established for the M managed characteristic application by:

responding to application and host failures by determining if and what recovery actions should be taken;

determining if and where to place new copies of managed characteristic applications or which managed characteristic applications should be shutdown when QoS Manager functions indicate that scale-up or scale-down actions should be taken based on measured application performance and QoS specifications established for the M managed characteristic applications;

determining where new applications should be placed when requested to do so by the fourth function group; and

determining which and how many applications should run based on application system priorities.

35. The software as recited in claim 26, wherein the third function group makes decisions by one of:

based on requests from Program Control, determining where new applications should be started;

based on indication of application failure from the fourth function group, determining whether and where the failed application should be restarted;

based on indication of host failure from the fourth function group, determining whether and where the failed application previously instantiated by the failed one of the N hosts should be restarted;

based on startup and shutdown dependency resolution requests from the fourth function group, determine whether and where additional applications should to be one of started and shut down prior to starting or shutting down another application; and

based on changes to application system priorities, determining whether and where new applications need to be started and/or determine whether and which existing applications need to be shutdown.

36. The software as recited in claim 26, wherein the third function group makes decisions one of:

based on application inter-dependencies defined in system specification files, determining whether and where additional applications should to be one of started and shut down prior to starting or shutting down of another application;

based on application instrumentation data generated by the second function group and performance requirements defined in the system specification files, determining whether applications are meeting performance requirements and whether an application can be scaled up or moved to attempt to improve performance; and

based on the application instrumentation data and performance requirements defined in the system specification files, determining whether applications are performing well within performance requirements and can be scaled down.